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In This Issue

Cover: Our cover may not depict good farm management but few can dispute its stark beauty.

The Future of Macdonald College

McGill University and John Abbott College through their respective Boards have concluded an agreement whereby John Abbott College will lease part of the land and buildings of the Ste. Anne de Bellevue campus, will share with McGill the costs of plant services and will be permitted to construct new academic buildings while conserving the ambiance of Macdonald College. Broadly speaking, McGill will retain the eastern portion of the campus for the Faculty of Agriculture, its School of Food Science and the Institute of Parasitology and other non-Faculty units, thus ensuring direct access to the farming and research facilities north of route 2-20. This arrangement will permit John Abbott College to provide on one site the full collegial services required by the West Island Anglophone community. It will require the Faculty of Agriculture to release some of the premises which it has occupied hitherto and the University is committed to providing a major new building to permit the regrouping and modernization of the facilities of the Faculty.

Implicit in this agreement is the understanding that McGill and John Abbott will actively promote the joint use of all appropriate facilities such as athletics, health, and food services. They will also seek to maximize all aspects of administrative and academic liaison in order to make the greatest possible common use of the campus. Thus the agreement is expected to meet the major objectives in the West Island area of both the University and John Abbott College.

Statement by Principal Bell on Macdonald College

McGill's Principal Dr. Robert Bell said, "It is the hope of us all at McGill that this agreement and the developments which can flow from it will give to the Faculty of Agriculture a new impetus and enable it to continue its great contributions not only to the University but to the whole community.

"There have been widely divergent views on a solution to the complex problems of agricultural science at the University. I believe that we have now reached the most satisfactory solution possible within the present framework. The challenge to us all is to work together to overcome the short-term disruptions which will result from the reallocation of space and to assure the success of the new plans. We also need to assure the strong development of the

Dr. Robert Bell

Faculty and its collaboration with its neighbours in John Abbott College and Macdonald High School to provide a remarkable, unique complex of educational facilities.

"Macdonald College has been both an academic organization and a geographic locality. Its establishment in 1907 for vocational training of agriculturalists, home makers, and teachers for rural Quebec was the largest of many munificent contributions made by Sir William Macdonald to McGill and, through the University, to the community at large. The whole of McGill, but especially Macdonald College, has benefitted academically and physically from the continued generosity of the Stewart family, Sir William's heirs. Mr. David Stewart has continued their involvement and has supported Macdonald College and the Faculty in many ways. His personal interest in the programs being developed is a source of continuing encouragement.

"Macdonald College came into being to help improve rural society, especially in Quebec. This has certainly been achieved and, with the passage of time, the nature of the demands upon the university have changed.

"The McGill Normal School founded by Sir William Dawson in Montreal in 1857 became, on the Macdonald Campus, first the School for Teachers, then the Institute and finally the Faculty of Education. Its needs for contacts and facilities, which are available only on the main campus, led to its return to Montreal in 1970 where it became the focal point for training all English language teachers in the Province, both Catholic and Protestant.

"The campus which we must develop for the Faculty of Agriculture will be conceived to provide for the continuation of all that it represents. Again, its tradition goes back to Sir William Dawson who gave the first course in Agriculture in 1856. Since 1907 the Faculty has established a most distinguished record in teaching, in research, and in direct service to the Quebec agricultural community. Its influence for good has not, however, stopped at provincial borders and, through collaboration with such institutions as the Canadian International Development Agency, has spread into many parts of the world.

"Agricultural and food sciences have made enormous progress in the 70 years since construction of Macdonald College began. Agriculture itself has changed its structures. Today a high proportion of graduates of the Faculty enter the food processing and allied industries.

"Household science, later becoming home economics, was very much a concern of Sir William Macdonald. This is now handled at the school and college levels and our School of Home Economics has become a School of Food Science at a higher level of expertise than was once conceived.

"Given these changes of direction, it must be of great value to us all that McGill should be closely associated with high school and CEGEP education. I am sure that Macdonald High School and John Abbott College are ready to develop co-operative efforts to the community's greater advantage. Such moves will assure the wholehearted commitment of the college site to Sir William Macdonald's aims for English language education in Quebec.

"Logistic planning is well under way in order to reduce to a minimum the inevitable inconvenience and disturbance involved in rearranging the Faculty's facilities, and architects are already at work on the design of a new building required by the Faculty of Agriculture. These architects Marshall, Merritt, Stahl, Elliott and Mill will be collaborating with D. W. Graham & Associates, the landscape architects appointed by the University to advise on the planning of the whole campus site.

"We are determined that the Macdonald College motto, 'Mastery for service,' shall continue to express its aspirations."

Hydroponics — Soilless Culture of Plants

by Professor B. Bible
Department of Horticulture

The artificial culture of plants without soil has intrigued scientists, gardeners, and hobbyists for many years. Although hydroponics has come to be an all-inclusive term referring to water culture, solution culture, sand culture, gravel culture, soilless culture, mist culture, nutriculture, etc., it was originally used by W. F. Gericke to describe a water or solution culture system where the plant's roots are suspended in nutrient solutions without a solid medium for anchorage. All systems listed above are methods for using a soilless medium for culturing plants.

Soilless culture was tried on a large scale by the United States Armed Forces in Japan. At Chofu in late 1945, they established five acres of soilless culture gardens under glass and 25 acres out-of-doors, and at Ostu 25 acres out-of-doors. From 1947 to 1957, about 100,000,000 pounds of fresh vegetables were grown at Chofu and Otsu for U.S. personnel in Japan, Okinawa, and Korea. Cost of production per pound of produce was about the same in soilless culture as in soil.

Despite this and other successes with soilless culture, significant commercial application has been generally limited to small acreages in climatically favourable regions such as the U.S. Southwest and Florida. The high cost of installing soilless culture gardens, the considerable technical knowledge required to set up the equipment and handle the problems which may arise, together with the fact that a good soil properly fertilized can produce yields comparable to any soilless culture system (Table 1), have severely limited its commercial development.

History

In the early 1800s, DeSaussure proposed the theory that plants are made up of chemical elements obtained from water, soil, and air. By 1840, Jean Boussingault, a French chemist, had demonstrated that healthy plants could be grown on inert sand or quartz if nutrient solutions were used to water the plants. In the late 1850s, Sachs and Knop were both able to formulate nutrient solutions for soilless culture very similar to those in use today. This early work provided proof for the mineral theory of plant nutrition and demonstrated the feasibility of growing plants in an artificial medium.

Since then, scientists using the technique of soilless culture have been able to determine which elements are required for plant growth by leaving out one element at a time from a known mixture of elements in a nutrient solution. If an element required for plant growth is left out of the nutrient solution, characteristic "deficiency symptoms" appear on leaves. Such symptoms are widely used to diagnose deficiencies in field and greenhouse grown plants. Thus the technique of soilless culture has been instrumental in many discoveries in plant nutrition that have profoundly influenced the practical art of soil management and fertilizing for crop production.

Requirements for Plant Growth

Obviously, no technique for growing plants with or without soil can act as a substitute for any of the basic requirements of plant growth; (1) adequate light; (2) suitable temperature; (3) water; (4) air (carbon dioxide and oxygen); and (5) mineral salts. Plants require 16 elements: carbon, hydrogen, and oxygen (obtained from air and water); the major mineral elements, nitrogen, phosphorus, potassium, calcium, magnesium, and sulfur which are supplied in part from fertilizers and lime; and the seven micronutrients, boron, manganese, zinc, copper, chlorine, molybedenum, and iron.

In the plant's primary growth process (photosynthesis) the element carbon, which forms a large part of all organic matter, is fixed by leaves from air. Within the

Table 1. Comparison of water culture and soil as media for productivity of greenhouse grown vegetables. Based on observations of student lab[a] results in Vegetable Physiology courses during the past six years.

Crops that tend to be more productive in water culture	Crops that are equally productive in water culture or soil	Crops that tend to be more productive in soil
Tomato	Carrot	Cabbage
Garden beets	Peas	Turnip
Celery	Potato	Muskmelon
	Radish	Cauliflower
	Green beans	Onion
	Cucumber	
	Sweet Corn	

[a]All labs were held from September through early April in the Horticulture greenhouse at Macdonald College.

Tomatoes growing in a bed system that would be suitable for hydroponics.

plant, carbon dioxide is converted to carbohydrates, fats, proteins and a host of other organic compounds. The mineral elements absorbed by roots are essential for plant growth but not as energy sources, and therefore cannot be regarded as "plant food". Similarly, organic matter in the soil or applied as manure to plants cannot be regarded as "plant food" as is often implied or stated by organic gardeners. During the past hundred years, there have been countless scientific demonstrations of healthy, vigorous plant growth in soilless culture solutions that contained only the essential mineral salts. This finding should not be surprising inasmuch as the essential nature of green plants is not to act as consumers of organic matter, but to act as converters of simple chemical building blocks such as carbon dioxide, water, and inorganic mineral elements into the complex compounds making up organic matter.

Pros and Cons of Soilless Culture

Most importantly, soilless culture can be used to great advantage in scientific research. Its other advantages and disadvantages as enumerated by Ellis, *et al* (1974) are:

Advantages

1. Crops can be grown where no suitable soil exists or where soil is contaminated with disease. (The latter situation is responsible for the soilless production of greenhouse tomatoes in British Columbia).
2. Labour for tilling the soil, cultivation, fumigation, watering and other traditional practices can be reduced and sometimes eliminated.
3. Maximum yields are possible, making the system economically feasible in high density and expensive land areas.
4. Soil-borne plant diseases are more easily eradicated in many soilless culture systems.
5. More complete control of environment is generally a feature of the system, i.e., root environment, timely nutrient feeding or irrigation.
6. Water carrying high-soluble salts may be used with extra care.
7. The amateur horticulturist can adapt a soilless culture system to home and patio-type gardens even in high rise buildings. A soilless culture system can be clean, light weight, and mechanized.

Disadvantages

1. The original construction cost per acre is great.
2. Trained plantsmen must direct the growing operation. Knowledge of how plants grow and the principles of nutrition are important.
3. Introduced soil-borne diseases and nematodes may be quickly spread through the growing beds.
4. Most available plant varieties have been developed for growth in soil.
5. The reaction of the plant to good or poor growth is unbelievably fast. The grower must observe his plants often.

Basic Soilless Culture Techniques

At present, three general methods of growing plants with nutrient solutions, collectively termed soilless culture, are in use. These are (1) water or solution culture; (2) sand culture, and (3) gravel culture.

The water culture method has received much attention, but physical limitations associated with it prevent commercial application. Plants are grown with their roots suspended in a shallow tank or bucket of nutrient solution. Having no solid medium as an anchor, plants must be physically supported over the tank by a supporting frame. The solution must be aerated in order to supply adequate oxygen to the roots. This may be done by circulating the solution with a pump that also mixes air with it or by bubbling air pumped into the solution. For the hobbyist, who has converted a fish aquarium to a nutrient tank, the aquarium aerator can be used to continuously inject air into the nutrient solution.

In sand culture, beds, benches, or pots are filled with fine sand (optimum particle size between 0.5 to 1.0 mm diameter) and watered with nutrient solution applied to the surface of the sand. Sand cultures are also referred to as "open systems" in that the nutrient solution is not salvaged and reused but allowed to drain away. As this technique can be wasteful of nutrients and water, in the past it was considered not suitable for large-scale crop production. However, the

recent development of sheet plastics and plastic tubing and fittings (which are used for "drip" or "trickle" irrigation systems) has improved the outlook for "open systems".

Gravel culture is essentially the same method as that of sand culture except that nutrient solutions are recycled (closed system) and applied by sub-irrigation. Reusing the nutrient solution limits the type of growing media to coarse aggregates, preferably gravel, cinders, haydite, or expanded vermiculite sizes between 1.5 to 12 mm in diameter. The U.S. Armed Forces used a gravel culture system, with the beds divided into three or four sections, each one a higher elevation and slightly longer than the one following it, for their large scale installation. The nutrient solution flows into the first section from a holding tank by gravity and then successively through the other sections, finally emptying into a sump tank. By this means only the solution for irrigating the first section has to be pumped.

Composition of Nutrient Solutions

There is no best nutrient solution; however, there is a general similarity among the various formulations published. The greatest difference among formulas usually lies in the ratio of nitrogen to potassium. This is because plants require relatively more nitrogen than potassium during sunny periods and relatively less nitrogen than potassium during periods of poor light such as the short overcast days we experience from November through February.

A simple formulation of a nutrient solution may be made with four major salts: potassium nitrate KNO_3, calcium nitrate $Ca(NO_3)_2.4H_2O$, monopotassium phosphate KH_2PO_4, and magnesium sulphate $MgSO_4.7H_2O$. For 5 gallons of solution the numbers of teaspoonsful of salts are: 2½, 4, ½, 2½ respectively. Each salt should be prepared and dissolved separately, then mixed and diluted to 5 gallons. Each of the two micronutrient stock solutions below should be prepared. Micronutrient stock I — In ½ gallon of water dissolve 1 teaspoonful each of boric acid and manganese sulphate. Two teaspoonsful of stock I is added to each 5 gallons of nutrient solution. Micronutrient stock II — Dissolve 1 teaspoon of iron tartrate or iron citrate or iron sulphate in 1 quart of water. Add this to the solution at the rate of 5 teaspoonsful to each 5 gallons of nutrient solution. Zinc, copper, chlorine, and molybedenum are needed in minute amounts and will probably be supplied as impurities in water or chemicals or from the containers. Five gallons of this solution will supply enough nutrients for 1 to 2 pounds (fresh weight) of plant growth; however, for the beginner it may be easier just to change the solution every 7 to 10 days.

Some of the nutrient formulations used for experimental purposes may be of interest for science classes and others interested in plant nutrition. Molar stock solutions for each major nutrient salt should be prepared (Table 2); the amounts indicated in Table 4 are used to make up the various formulations. Hoagland and Arnon's (1950) two solutions have probably been used more widely for scientific work than any others. However, for some plants their formulation is too concentrated and should be diluted to half strength.

Future of Soilless Culture

For the ever-growing population of urban dwellers with limited access to land, it appears that soilless culture may be the only way to do some gardening. Soilless culture techniques now are used routinely in plant research. Look for even more use of these techniques by agricultural scientists around the world.

Large scale commercial use of soilless culture appears to be doubtful. However, the introduction of "drip" and "trickle" irrigation equipment offers economical methods of applying nutrient solutions to field plantings. Anyone considering commercial soilless gardening should consult with qualified agricultural specialists and study the following references before starting.

Table 2. Amounts of chemicals, in grams, used to make up one molar stock solution

	Chemical	Grams of salt required	Total volume (milliliters) salt plus distilled water
$Ca(NO_3)_2 . 4H_2O$,	Calcium nitrate	236	1000
KNO_3	Potassium nitrate	101	1000
KH_2PO_4	Potassium phosphate, monobasic	136	1000
$MgSO_4 . 7H_2O$	Magnesium sulphate	246	1000
$NaH_2PO_4 . 2H_2O$	Sodium phosphate, monobasic	156	1000
$NH_4H_2PO_4$	Ammonium phosphate, monobasic	115	1000
KCl	Potassium chloride	74	1000
$FePO_4$	Ferric phosphate	150	1000

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Table 3. Hoagland and Arnon's (1950) micronutrient stock mixture

Chemical		Grams dissolved in 1 liter of water
H_3BO_3,	Boric acid	2.86
$MnCl_2 . 4H_2O$	Manganese chloride	1.81
$ZnSO_4 . 7H_2O$	Zinc sulphate	0.22
$CuSO_4 . 5H_2O$	Copper sulphate	0.08
$H_2MoO_4 . H_2O$	Molybdic acid	0.02

Add iron in the form of 0.5 per cent iron tartrate solution or other suitable iron salt, at the rate of 1 ml for each liter.

Table 4. Nutrient formulations

1 molar stock solution[a]	Milliliters in a liter of nutrient solution
Hoagland and Arnon (1950) # 1	
KH_2PO_4	1
KNO_3	5
$Ca(NO_3)_2 . 4H_2O$	5
$MgSO_4 . 7H_2O$	2
Micronutrient mix	1
Iron tartrate	1
Hoagland and Arnon (1950) #2	
$NH_4H_2PO_4$	
KNO_3	
$Ca(NO_3)_2 . 4H_2O$	4
$MgSO_4 . 7H_2O$	2
Micronutrient mix	1
Iron tartrate	1
Long Ashton (1966)	
$NaH_2PO_4 . 2H_2O$	1.3
KNO_3	4
$Ca(NO_3)_2 . 4H_2O$	4
$MgSO_4 . 7H_2O$	1.5
Micronutrient mix[b]	1
Iron citrate	1

1 molar stock solution	Milliliters in a liter of nutrient solution
Knop (1865)	
KH_2PO_4	1.5
KNO_3	2
$Ca(NO_3)_2 . 4H_2O$	5
$MgSO_4 . 7H_2O$	0.8
$FePO_4$	0.7
Ellis et al (1974) for fruiting cucumbers	
KH_2PO_4	2
KNO_3	2
$Ca(NO_3)_2 . 4H_2O$	6
$MgSO_4 . 7H_2O$	2
Micronutrient mix[b]	1
Iron citrate	—
Macdonald Horticulture Department for fruiting tomatoes	
KH_2PO_4	1.2
KNO_3	3.8
$Ca(NO_3)_2 . 4H_2O$	2.6
$MgSO_4 . 7H_2O$	1
KCl	0.3
Micronutrient mix	1
FeEDTA[c]	1

[a]See Table 2
[b]Micronutrient mix similar to Hoagland and Arnon, Table 3
[c]Chelated iron, NaFe EDTA used at 5 ppm in the final solution

In Conversation

The Subject Was Forages

One very hot afternoon late last July I asked three members of our Faculty: Professor R. S. Broughton, of the Department of Agricultural Engineering, Professor N. C. Lawson, of the Agronomy Department, and Professor A. F. MacKenzie, of the Department of Renewable Resources, to discuss forages in Quebec. The following is an edited version of their discussion which wandered at times away from the subject of forages. We hope in some future issue to publish the remainder of their most interesting conversation.

Professor Lawson: At a meeting the other day I learned that the two million acres that was originally intended to be the objective of Opération Lucerne and which was later reduced from two million to one million, has a new estimate — apparently 500,000 acres by 1980. I was rather interested in assessing what had happened during the last three years of the program. Apparently we started off with a little more than 300,000 acres of alfalfa and alfalfa mixtures and today we still have 300,000 acres. The progress to date, therefore, has been very disappointing.

Professor MacKenzie: I felt that Opération Lucerne was an ill-conceived program for Quebec because we have so much acid, poorly drained soil that is not adapted to alfalfa. The time that was spent on Opération Lucerne should have been spent on other crops that perhaps are more adapted to our soil conditions.

Professor Lawson: An important question: At what rate can the agricultural engineer improve soils so that we can utilize them for alfalfa or, indeed, if we spend the money on the drainage of these soils, one might ask the agronomist is alfalfa the thing to grow rather than a crop of higher value?

Professor Broughton: Obviously the reason for growing alfalfa is to have a higher protein crop as a forage crop in our climate where we have adequate water and don't have to irrigate as they do for alfalfa in the West. However, alfalfa also needs good drainage. We have a number one drainage problem here in the St. Lawrence Lowlands which the Ministry of Agriculture, the farmers, and the drainage contractors are attacking quite vigorously. We are putting in about 50 million feet of drains per year right now. At this rate we can drain about 80,000 acres per year, perhaps 25 per cent of that 80,000 acres could be designated as land for alfalfa. Seventy-five per cent of it is going to be used for corn, cereals, vegetables, and canning crops.
That means that the most rapid rate that we can expect an increase in subsurface drained land for alfalfa is about 20,000 acres per year. We understand that the Ministry of Agriculture has goals for encouraging an increase in the area drained per year by perhaps a factor of two in the next five years. So perhaps one might reach a rate of increase of drained land for alfalfa of 40,000 acres per year by 1980. If the goal is 500,000 acres, it is going to take 12 years to reach it from the standpoint of drainage alone, but a lot of liming of the land will be necessary to bring the pH up to a level were alfalfa will grow.

Professor Lawson: Subterranean drainage is obviously a costly and slow business. What about surface draining of land?

Professor Broughton: Improving surface drainage is undoubtedly desirable and a great deal has been done in Quebec over the last 200 years and more of it will be done, but I feel that the real winner is the combination of surface and subsurface drainage. There are relatively few places where we can eliminate the problem of soils being saturated nearly to the surface by surface drainage alone. Surface drainage can get rid of the little pondings that occur whenever the rainfall comes very rapidly or when the snow melts. Our lands are flat enough, however, that the rains we get most of the time will not give surface run-off until the soil is saturated nearly to the surface. Unless we have some subsurface drainage to let part of that excess out the bottom, the soil is going to stay saturated long enough to kill off crops such as alfalfa and winter wheat and severely retard corn and vegetables. For the high value crops such as alfalfa, vegetables, and grain corn improved surface drainage will allow us to put subsurface drain laterals farther apart. This would cut down on the cost per acre for subsurface drainage. The combined cost of surface and subsurface drainage is likely to remain about equal to the current cost for subsurface drainage — anywhere from $200 to $400 per acre depending on the hydraulic conductivity of the soil.

Professor MacKenzie: If we could digress slightly, the acreage that you say is improved through

drainage for alfalfa is not too far off the projected acreage lost due to urbanization and increased population so perhaps we are not gaining as much as we think we are.

Professor Broughton: You are right. We are losing good land in some places while trying to gain it in others. Not all of those projected acres for new cities or city enlargements are coming off the same land that is currently being subsurface drained. One of the companion efforts must surely be to develop new towns and villages in places which make sense from an industrial standpoint and can be built on some of the stony areas not suited for farming. Our current towns and villages are in places that made sense from an agricultural standpoint 100 years ago but don't make sense as industrial towns today.

Professor MacKenzie: Alfalfa certainly is a productive crop if we have the right soil conditions; namely well-drained soil, high pH, and good fertility. We have very large acreages of slightly improved or unimproved lands which currently are not receiving much attention. What about forage production in some of our less adapted soils? What do we have in terms of varieties and potential productivity, and so on?

Professor Lawson: I agree that this is an area that has been ignored and that perhaps in an immediate sense we could do more, more rapidly, and at lower costs than will be achieved through drainage. In Ontario during the last 15 or 20 years about one million acres of birdsfoot trefoil have been established on land which is useful for one crop of hay a year followed by grazing. There's no question that if you are talking of intensive production and two or three cuts of haylage per season, that alfalfa can do it under the correct conditions. Many farmers, however, have been satisfied with a lower investment under a single cut system. The big difference between areas of Ontario that have been successful in growing birdsfoot trefoil and Quebec where we seem to have been unable to grow it sucessfully is the level of pH. This is 7.5 in the Bruce Peninsula whereas our pH level in much of Quebec is the reverse of this, i.e., 5.7. Alfalfa needs lime but this is also a problem with other crops. Birdsfoot trefoil has got to have its lime, too.

Professor MacKenzie: We don't have the advantage of having our soils developed on limestone as they do in a great part of Ontario. Ours, like parts of eastern Ontario, are developed on more acidic materials, and this is a real problem not only for forages, but for just about all crop production. Fortunately the soil acidity problem is one of the cheaper problems to cure if we could just get around to it and get the right kind of liming materials. We need very fine, low magnesium liming material which will react rapidly. There are some quarries in Quebec, unfortunately, that are selling high magnesium material which reacts much more slowly and is only valuable over a long term such as 10 to 15 years. Most farmers want results right away. We could improve production through some of our simpler techniques such as liming.

Professor Broughton: What is the approximate cost to bring the pH up from 5.7 to 6.7 or 7 which would be desirable for alfalfa?

Professor MacKenzie: This is going to depend on the soil. A loam soil requires three to four tons of limestone per acre. It is not expensive; I would say approximately $10 to $30 per acre every five years depending on government subsidy of line.

Professor Broughton: As lime is essential to almost any crop production in Quebec maybe further effort is needed to develop additional lime quarries or other improvements to reduce transportation costs.

Professor MacKenzie: With trefoil do you have to have arable soil? Do you have to cultivate it or can you establish it on some of our really rough pastures where rocks and topography prevent cultivation?

Professor Lawson: Our colleagues at Guelph have done a considerable amount of work on this, and they have concluded that trefoil is suited to deep soils rather than shallow soils. In their experiments they have decided that they really do not want to recommend it for extremely stony situations where there is not very much depth of soil. However, having once decided that deep soils are a good thing, they are then prepared to recommend that you do not need to cultivate these deep soils. They recommend a once-over system whereby a farmer can apply a mixture of 35 pounds per acre of granular dalapon herbicide, 10 pounds per acre inoculated birdsfoot trefoil seed, and 100 pounds per acre of triple superphosphate (0-46-0) fertilizer. These are mixed together shortly before application and can be applied by hand on a particularly hilly situation where a machine cannot be used. It can also be applied through a fertilizer distributor. This once-over treatment is carried out fairly early in the spring (mid to late April).

The herbicide kills the surface vegetation and gives the seeds a chance to establish with reduced competition and the phosphorus fertilizer gives the seedlings that little bit of a boost that is essential. Much of the area in Ontario that has been seeded with trefoil has been seeded this way. Now obviously this is suited to the rocky land situation particularly. If one does have a Brillion type seeder, then the thing to do is use it. People agree that a lot of our seeding problems with a crop like birdsfoot trefoil is due to the use of an unsatisfactory piece of forage seeding equipment, namely, the grain drill. Forage is often seeded too deeply and you never see it again but a Brillion seeder or any of its close relatives does an excellent job of keeping the seed close to the surface and pressing it in well.

Professor Broughton: How often would you need to re-establish birdsfoot trefoil on land like you have just described?

Professor Lawson: Probably every seven to 10 years there would be a case for rejuvenation but there are a number of fields that have been down for 15 years in Ontario.

Professor Broughton: This kind of rough or stony land or hillside land that we are referring to is really only suitable for pasture. It is not for hay production.

Professor Lawson: That is right. There is a lot of low grade land on most farms in Quebec and it should really be pressed into production using this system. It is very interesting that these days there seems to be a greater interest in the use of pastures on the farm. For a number of years there was considerable discussion about stored feed, greater intensification of production, the greater use of gasoline and energy in moving forages about, in other words zero grazing or stored feed systems. Nowadays with the high cost and possible future shortage of energy, it probably is a good thing to reconsider those areas that are good for pasture. It may be worthwhile to let dairy cows do a little of their own foraging again.

Professor Broughton: Let's never forget the problem of fencing that goes with pasturing. The cost of fencing and the energy that goes into it are quite high. I agree that it is desirable to let the cattle do the harvesting on a lot of land, but it takes some control and creates certain problems, too. If the pasture happens to be near highways where snow is being blown off, the life of the fences will be shortened considerably with snow weighing the fences down and salt causing them to rust very quickly.

Professor Lawson: Do you have the figures on the cost of fences?

Professor Broughton: The cost would be about a dollar a yard for a good cattle fence today — maybe more than that.

Porfessor MacKenzie: What about electric fences?

Professor Broughton: They are less expensive and are excellent as interior fencing. They are not generally considered sufficient along highways.

Professor Lawson: One of the interesting developments in agronomy these days is the fear in certain quarters that our recommendations about the use of grasses with high nitrogen fertilization are something that should be relegated to the background because of the high cost of nitrogen.

Professor MacKenzie: Yes and no. There are advantages and disadvantages. The one thing about grass is that even after a very severe winter it still grows. Whereas certainly with alfalfa — I am not sure about trefoil — winter-killing is a real problem. However, there is this: to get equivalent production to alfalfa you need to apply something in the neighbourhood of 300 pounds of nitrogen fertilizer on grass. About 300 pounds of actual nitrogen, which is almost 1,000 pounds of ammonium nitrate, does not come cheaply any more.

Professor Broughton: That's the cost of a couple of tons of hay per acre purchased at the cheaper harvesting time. If we can put on lime so that we can grow legumes which fix nitrogen, we would benefit from the mixture of legumes and grasses, and in the event of severe winter-killing we would still have something.

Professor MacKenzie To get back to the cost of hay: that 300 pounds of nitrogen fertilizer will cost about $75 to $80 plus the cost of application. We are dealing with $90-$100 an acre which gives you five tons as opposed to 1½ to two at a no-fertilization rate, so you're gaining say three tons of hay which means that at present prices it would be much cheaper to buy hay standing in the field than to put on the fertilizer. There's not many people who have to pay more than $15 per ton standing in the field. With 40 bales to the ton that would be $2 a bale.

Fertilizer prices have gone up. Crop prices have gone up even more than fertilizer prices, so I think it's still paying to fertilize at the same level. How long it stays this way depends on so many things. I don't recommend applying 300 pounds of nitrogen if you have a legume that will do it for free. That does not make sense.

Professor Lawson: Do you think that the farmer could utilize barnyard manure in his hayfields?

Professor MacKenzie: If they are high in grass, this is a really good place to put the barnyard manure.

Professor Lawson: But if there are alfalfa fields, I suppose you are better to stay clear of barnyard manure.

Professor MacKenzie: Put barnyard manure on your high nitrogen-demanding crops such as grass or corn. These are two good examples.

Professor Broughton: The increase in the price of fertilizer may do more to get manure back to the fields and thus avoid some of the pollution by animal waste that we have had in recent times.

Professor MacKenzie: You have to use gas to get this manure out to the field.

Professor Broughton: True, but we have to use gas to get fertilizer out to the fields, too. Also we already have to use gas to get the manure away from the barn. With a little organization we can get it right out to the field without using much more gas.

Professor MacKenzie: Plus, of course, along with the nitrogen in the manure you are getting phosphorous, potassium, calcium, and organic matter which is valuable for structure. Looking at Quebec it would seem to me that it is a forage province. Forages are everywhere. It's an area where we really should be doing more work. A lot of money is going to research in our more glamourous crops such as corn, the new cereals, the new oilseed crops and so on, but there is not that much in the soils end going into research on forages. Perhaps we should increase our efforts in this area.

Professor Lawson: This fact was brought home to me very strongly while travelling in central Ontario this summer. They invested a great deal of money in corn crops and many fields were suffering from the severe drought they were having. The corn crops looked miserable while the perennial forage crops, i.e., alfalfa, and birdsfoot trefoil, looked superb. There was no such thing as a crop failure or near failure in any of the perennial acreages, but there were a lot of very close failures in grain corn and silage corn.

Professor Broughton: We should note also those who planted corn early — before the 10th of May — on land that had subsurface drains did not seem to have a problem with drought. The corn that looked poorest was not planted until after the 20th day of May or the 1st. of June. That was on land which was poorly drained. The late-planted corn had not developed good roots before the drought hit. The hot weather has slowed the growth of the grass. You say it is not a forage crop failure, but it is not high forage production either.

Professor Lawson: This, of course, is where correct pasture management procedures need to be used.

Professor Broughton: If you don't have any pastures anywhere because of a long period of heat, how can you move around to somewhere where there's pasture?

Professor MacKenzie: There is nothing so beautiful in the middle of August, or beginning of August, as an alfalfa or legume field because it's green, it's lush, it's growing. Grass is not adapted to growth in hot, dry areas.

Professor Broughton: We are back to the point where we had better try and grow alfalfa, not large acreages but some parts of each farm where good drainage can be obtained.

Professor Lawson: This year it's quite clear that timothy has never been famous as a pasture plant simply because its aftermath growth is generally poor. In a year of drought its recovery after hay cutting can be negligible. However, orchard grass aftermath growth has been superb this year, so also has brome grass — probably better than I've seen it in the past five years.

Farmers should be careful about putting all their eggs in one basket — in only using one or two simple crops to solve all their problems. Once more it is clear that a range of forage crops wherever they are adapted should be used. In other words light, gravelly soils are great for brome and orchard grass. Heavy moist soils are excellent for timothy. One should never put the wrong grass in the wrong locality.

Professor Broughton: Brome grass is probably more adaptable than orchard grass to some of these wetter soils. It will stand flooding for some time without being killed, but it never looks as if it

is growing vigorously under these conditions.

Professor MacKenzie: It is unfortunate that Quebec farmers are going to be hard pressed to use all the ingenuity they've got in order to get an adapted forage species for the kind of soils we've got. Either that or they are going to have to pay a lot of attention to liming and drainage over a long-term basis. By the way, what's happening with clover?

Professor Lawson: Red clover has been with us for over 200 years and presumably will be with us for another 200 years. It is quite interesting that farmers have always detested red clover with its heavy stand simply because of the problems of getting it to cure and yet they know that as a protein crop it is still excellent. Nowadays, with less emphasis on hay and more on haylage, unquestionably red clover could fit very nicely into this system. We have been able to do virtually nothing in recent years about the disease question in red clover. The longevity of red clover is still poor and the only thing we can guarantee is one good harvest year. Very seldom does the second harvest year amount to much. Interestingly enough a lot of plant breeding effort in the last few years which has been devoted to longevity does not seem to have been utilized by the farmers. In other words, farmers will still buy commercial red clover seed because it is a few cents cheaper than pedigreed seed, even though it has been well proven that the pedigreed seed represents superior germ plasm. The cost of seed for the farmer is still paramount, it seems.

White clover as a pasture crop tends to be uncertain. Some years it survives beautifully; other winters it kills rather badly. It is always rather risky to depend on white clover in the pasture. We have our big supporters of white clover in Quebec and many a gallon of milk has been produced from white clover. We are talking here about ladino clover which, of course, is the only kind that we recommend these days in Quebec. We have problems getting good seed supplies of ladino and are dependent upon California and Oregon for the buying of clover seed, and from both of these areas the plant material tends to be of poor winter hardiness.

Professor Broughton: How much potential is there for growing ladino clover seed in Quebec?

Professor Lawson: Absolutely none because of the problem of pollination between the native wild white clover and ladino so that the hybrids that are produced as a result of this pollination all tend to be poor. Ladino clover seed crops must be grown in dry valleys in western U.S. under irrigation where there is complete freedom from contamination of other types of white clover. This means, for example, that breeding programs in places like Iowa or New York state, which have produced winter hardy forms of ladino, have never become popular. When they are moved out to the far West for multiplication, the seed yields on them were so poor that they never came through for commercial production. We are still dependent on these relatively non-winter hardy American western types.

Professor MacKenzie: The clovers, though, are a little less rigorous in their demands on soil as I understand it. They will tolerate a more acid soil compared to alfalfa.

Professor Lawson: This is correct. We still see a fair amount of alsike clover being grown in Quebec. It has not been on the recommended list now for about five years. The big problems with alsike clover is that it contributes reasonably to a first cut but there is absolutely no regrowth at all. There are some marginal situations where hay has been grown in Quebec and where hay yields of one ton are acceptable, i.e., wet soils of high acidity and very poor fertility, which is another reason to continue to grow alsike clover, but we do not take it too seriously these days as a crop for intensively cultivated areas.

Hazel Clarke: There's one question I would like to ask. Are we going to have to stop thinking of forage crops for animals and think of using the land for crops for human consumption?

Professor Broughton: No, I think we are going to definitely have to keep animals in the picture. We've really got a grassland and forest climate in Quebec and we have a lot of land that is not good enough for growing inter-tilled vegetable crops for direct human consumption. There's a lot of land that does not produce enough tons of forage or tons of consumable crop per acre to be handled any other way than by cattle or sheep. We may need to have a turn-around in land values and some other food values to reach a stage where farmers will really move their beef on to these rougher lands, but much of this land can only be satisfactorily cropped with animals.

Professor Lawson. It seems to me that there is no real conflict. We are always going to have an animal industry in Canada supported by forages.

The Family Farm

Published in the interests of the farmers of the province by the Quebec Department of Agriculture.

Good Seed, Rich Harvest

by J. B. Roy, Information Division

In the last issue, certain aspects of grain production in Quebec were dealt with and some details of the kinds and varieties of cereals grown here were given. This month, an article about the importance of good seed and the use made of grain crops seems to be in order.

Classes of Seed

To begin with, all seed is classed by law as either "pedigreed seed" or "general seeds of commerce".

1. Pedigreed Seed
   There are five classes of pedigreed seed: Breeder, Select, Foundation, Registered, and Certified. Only the last three are sold commercially. For practical purposes, only Certified seed is of interest to most farmers. It is guaranteed as regards trueness to variety, good germination, and freedom from noxious weeds and other impurities.

2. Certified Seed is produced from Breeder, Select, Foundation or Registered Seed which has been so managed as to maintain satisfactory genetic identity and purity under the supervision and subject to the approval of the Canadian Seed Growers' Association. Certified seed must be graded and sealed by an inspector of the Plant Products Division, Canada Department of Agriculture.

General Seeds of Commerce

The Seeds Act requires that general seeds of commerce meet certain standards of germination and freedom from seeds of specified weeds and other cultivated plants, but it does not guarantee genuineness of variety and, in fact, prohibits mention of a name or number.

Certified seed makes for a healthier crop and a higher yield than does seed taken from grain grown on the farm and its use is the most practical way of preventing certain diseases such as loose smut of wheat and barley.

Advantages of Certified Seed

The use of Certified Seed has a number of advantages:

1. It guarantees the varietal purity of the crop and hence favours even maturity.
2. Certified seed has not degenerated and its vitality gives it added vigour.
3. The germination rate or percentage of Canada Certified No. 1 seed is very high.
4. Certified seed is very well cleaned and de-awned. The grains are of uniform size and this uniformity helps them to flow easily through the seeder, thus permitting even seeding with the right quantity per acre.
5. The Seeds Act tolerates practically no seeds of weeds or of other cultivated plants in Certified seeds and no seeds at all of prohibited or primary noxious weeds.
6. Thanks to the above-mentioned qualities, bigger average crops can be grown from less seed.

Seed Treatments

Besides ensuring genetic purity and a high germination rate, pedigreed seed is usually treated against what are called seed diseases.

A grain grower who persists in using his own seed or who sows feed grain should at least use the best of it, carry out a germination test, clean it, and disinfect it.

Germination Test

The first thing to look for in good seed is a high germination percentage. It is not always certain that the embryo plant in a grain of oats, barley, wheat or any other kind of plant will germinate, and it is impossible to tell for sure just by looking at it whether a seed will sprout. However, there are certain visible signs of poor germination. One should not expect small, light, shrunken or broken grains to sprout as much and as vigorously as plump, healthy grains of normal size.

Cleaning

Freedom from impurities is another thing to look for. "Impurities" means inert matter (dust, clumps, etc.), seeds of other varieties or weeds, etc. Their presence diminishes the value of the seed, makes for uneven germination, spreads weeds and reduces the value of the crop. Impurities can be removed to a considerable extent by cleaning the seed. This should be done during the winter. If it is left till seeding time, it may be neglected for lack of time.

Disinfection

Proper attention should also be paid to disinfection. Cleaning alone does not ensure good seed because there is still the problem of disease. Even the cleanest and most carefully selected seeds will not produce the desired seedlings if they are infected with disease. To prevent such setbacks, seed must be disinfected to rid it of the germs of disease which may be clinging to it. To be effective, the treatment should result in each grain being coated with disinfectant as completely as possible.

Liquid treatment of cereal seed may be carried out a few weeks ahead, at the same time as cleaning, because its effectiveness lasts. If there is no disinfection service at the seed cleaning centre, a dry treatment can be applied directly by mixing a disinfectant with the grain in the seeder and then seeding immediately afterwards. As the results of this method are often unsatisfactory, it is better to make use of devices like a cement mixer or duster.

Control of Weeds

Weeds in a grain field can cause considerable losses by:

1. Reducing yields. They compete with the crop for moisture and light and for plant nutrients in the soil.
2. Lowering the quality of the crop. Removal of weed seeds from the grain can be very expensive because some kinds are difficult to separate, with the result that the grain has to be cleaned several times. Some weeds are poisonous and others give the grain a bad taste.
3. Harbouring harmful insects and some plant diseases.
4. Leading to difficulties during harvesting and perhaps causing the grain to heat.
5. Detracting from the appearance of the grain fields and also from the farmer's reputation.

Ways of controlling weeds

There are two practical ways to control weeds:

1. Farming practices

In the first place, efforts must be made through crop rotation, summer fallowing, seed cleaning, etc. to stop weeds from multiplying and spreading.

2. Chemical control with herbicides

Wisely and properly used, herbicides are effective but the user must realize that their use involves risks because of problems involved, such as crop injury, residues on the plants and in the soil, and possible pollution of air, water, etc.

There is too big a tendency to rely solely on chemicals to control crop pests. Although herbicides are one of the essential means of control, steps should first be taken to prevent weeds from propagating.

Recommended Cereal Varieties

Oats	Barley	Spring Wheat
Stormont (early)	**Bonanza** (medium early)	**Selkirk** (early)
Recommended only if there is risk of lodging. Lower yielder.	6-row. Malting and feed. Semi-smooth awn.	Resistant to stem rust and smut. Susceptible to mildew and leaf rust.
Garry and Yamaska (medium early)	**Conquest** (medium early)	Glenlea (early)
	6-row. Malting and feed. Smooth awn.	Resistant to stem rust and leaf rust. Resistant to root rot and loose smut.
Dorval (medium late)	**Parkland** (medium early)	**Pitic 62** (late)
Particularly useful for grazing and ensiling.	6-row. Malting and feed. Smooth awn.	Contains about 2% less protein than Selkirk. Semi-resistant to stem rust and leaf rust. Susceptible to loose smut, bunt and ergot.
Roxton (late)	**Loyola** (medium early)	**Opal** (late)
Particularly useful for grazing and ensiling.	6-row. Feed. Smooth awn.	Contains about 2% less protein than Selkirk. Susceptible to stem rust and leaf rust; resistant to ergot.
Alma and Scott (medium early)	**Champlain** (medium late)	**Neepawa** (early)
	6-row. Feed. Smooth awn.	Better yielder than Selkirk.

Harvesting

The yield of a good stand of grain can be impaired at harvest time if not enough attention is paid to this important operation. Two points to be considered are stage of maturity and harvesting methods.

Stage of Maturity

The stage of maturity has a big effect on the yield and quality of the crop. Grain which is harvested green gives a smaller yield. On the other hand, if it is cut at a more advanced stage, there is a risk of loss from shattering. Grain which is threshed while too moist is of pure quality and will heat.

The following table describes the stages of maturity suited to different methods of harvesting:

TABLE 1 — A Guide to Grain Maturity

Stage of Maturity	Characteristics	Grain Moisture %	Harvesting Methods
Plant turning yellow	The grain can still be split between thumb and finger. The plant turns to yellow.	30-35	Windrower Binder
Mealy grain	Grain can only be split with thumb nail. Mealy break. The plant is dried out.	20-25	Too late for windrower. Too soon for direct combining.
Ripe grain	The straw is brittle and dusty. The grain can be cracked only by biting.	14-18	Direct combining

Harvesting Methods

The two methods of harvesting grain now widely used are windrowing and direct harvesting. Each has its particular requirements.

1. **Windrowing** or **swathing** makes it possible to cut the grain several days earlier than in the case of direct harvesting with a combine.

For successful windrowing, the stubble must be long enough to hold up the grain and allow air to pass freely through it.

Difficulties with this method can be caused by long periods of bad weather which may intervene, especially after the end of August and by well-established forage plants that may hinder curing.

2. **Direct harvesting with a combine**

The rapidity of this operation makes it the most popular way to harvest grain. The combine cuts and threshes, separating the grain from the straw and cleaning it.

Success for direct harvesting with a combine depends on the following conditions:

Treating the grain-field against weeds;
— Harvesting when the grain is really ripe and very dry;
— Ensuring that the machine operates properly so as to reduce losses to a minimum;
— Reducing the width of the cut or the speed of travel if there is a lot of straw;
— Checking the moisture content of the crop, and taking the necessary steps in consequence.

Storage

The final quality of grain harvested even under the best conditions still depends on how it is stored. Good storage is related to the moisture content and temperature of the grain and the extent to which it discourages the development of microorganisms.

Grain keeps well when it contains 14 per cent of moisture or less. Low temperatures reduce the risk of heating even when the moisture content of the grain exceeds 14 per cent, but high temperatures (above 18°C) are conducive to heating.

Grain is stored in ordinary bins, steel bins, or sacks.

Sacked grain gets more ventilation and heats less than grain stored in bulk, especially if the latter is heaped high (over two feet deep).

Under our humid conditions, grain harvested with a combine needs cleaning, airing or drying to ensure good quality, because:

— large masses of grain retain heat and even favour its production;
— the difference in temperature between a mass of grain and its surroundings is enough to produce only a very slow movement of air inside the mass. As a result, there are apt to be pockets or areas of high humidity in the grain;

— harvesting conditions are very rarely ideal from the standpoint of getting in grain which will keep well in storage.

Cleaning

A quick cleaning will rid grain of weed seeds and impurities with their high moisture content.

Airing

Airing or ventilating harvested grain lowers its temperature and reduces heating. Sacked grain gets well ventilated if space is left between the floor and the piles of sacks. Small crops of grain may be put into a bin in layers a foot deep at a time and stirred around occasionally. The moving about of grain or its transfer from one bin to another is another effective way of lowering its temperature. However, these methods are only useful if the temperature of the air is at least 5°C lower than that of the grain.

Grain can be ventilated with forced air. This consists in causing a slow current of air to pass through the mass of grain fast enough to produce five complete changes of air per hour. This forced draught method calls for an installation whose arrangement will vary according to the type of storage (e.g. circular or rectangular). There are also portable blowers on the market. Grain growers can obtain full information about forced-draught systems from the Farm Machinery Division, Quebec Department of Agriculture, 200A, chemin Ste. Foy, Quebec, or from their regional agricultural engineering adviser.

Airing is not a way of drying grain, and a ventilation system cannot save a crop whose moisture content is more than one or two per cent above the safety level. Table II shows moisture levels for storing the principal grains.

TABLE II — Maximum moisture percentages for storing grain

Kind of grain	1 year or less	more than one year
Grain-corn	15.5	13.5
Wheat	14.5	14.0
Barley	14.8	13.5
Oats	14.0	14.0

Drying

Drying with hot air may be required if the moisture content of the grain is high. This method is of course faster and more effective but it has its risks. Temperatures which are too high may reduce the quality and germinative power of the grain.

It should be borne in mind that the higher its moisture content, the more sensitive the grain will be to unduly hot air. The following maximum temperatures are recommended for drying grain to be used for different purposes:

Livestock feed	77°C
Food industry	55°C
Seed	43°C

Markets and uses for grain

Grain production in Quebec is very inadequate. Its main purpose is to feed livestock but there are two other markets which offer possibilities: pedigreed seed and human food.

Pedigreed seed production

In 1974, Quebec produced 402,086 bushels of pedigreed seed oats. In 1975, Quebec farmers used about 500,000 bushels of pedigreed oats for seed. The difference between these two figures suggests existing possibilities; these will increase if the production of pedigreed seed remains stationary while an increasing percentage of the two million bushels of oats sown annually in Quebec is pedigreed seed.

Pedigreed seed began to be used and produced in Quebec a number of years ago. Tables III and IV show how production has grown since 1970.

The figures for 1972-73 and 1973-74 show that these two years were poor ones both for producers of pedigreed cereal seed and for ordinary grain growers.

The Certified class of pedigreed seed is the one recommended for general farm use for growing feed grains. Producers of Certified seed have to meet very exacting requirements which may vary according to the kind of seed. They must be members of the Canadian Seed Growers' Association and comply with its regulations.

TABLE III — Quantity of Pedigreed Seed Used in Quebec

Year	Number of farmers	Number of fields inspected	Acreage inspected	Acreage of Oats inspected	Estimated quantity of pedigreed oat seed used in Quebec (bushels)
1960	92	233	—	2,424	236,000
1965	217	554	7,610	5,844	500,000
1970	259	869	12,839	8,673	600,000
1971	278	862	13,224	8,851	
1972	309	959	14,294	8,372	
1973	267	770	13,239	7,950	
1974	353	1,119	18,828	11,207	500,000
1975	366	1,138	22,631	14,787	

TABLE IV — Quantity of Pedigreed Cereal Seed Produced and Sealed in Quebec

Twelve month period July 1 to June 30	Number of bushels
1960-61	68,511
1965-66	226,255
1970-71	405,954
1971-72	512,259
1972-73	252,408
1973-74	227,697
1974-75	402,086
1975-76	440,000 (estimated)

In view of these requirements, the production of pedigreed seed cannot become widespread but it is nevertheless a worth-while possibility for skilled farmers.

Cereals for human consumption

Quebec's annual cereal requirements for human consumption amount to about 850,000 tons. This comprises some 670,000 tons of wheat (one third of which is used for bakeshops), 118,000 tons of corn, rye, and barley used by distillers, and 62,000 tons of barley and corn for malting.

Growing grain for human consumption offers possibilities which are worth considering, especially as some farmers here already find it profitable.

Livestock feed

As already mentioned, most of the grain grown in Quebec is used for feeding livestock. In recent years, the total quantity of feed grain consumed here annually has ranged from 2.5 to 2.7 million tons while production has been only between 720,000 and 760,000 tons a year. Quebec's degree of self-sufficiency in feed grains thus amounted to less than 30 per cent during 1972 and 1973, although this was partly due to bad weather during those two years. However, production in 1974 was significantly better than in the two previous years. Requirements for feed grains in 1977 are forecast at 2.8 million tons and if Quebec's production remains stationary, the province's degree of self-sufficiency will be up to 30 per cent within two years.

That at least will be the situation if past trends in livestock population continue through 1977. On the other hand, if the Quebec Department of Agriculture's targets for livestock production are reached, feed grain requirements in 1977 would be up to 3 million tons. However, expected improvement in forage production (especially in alfalfa-growing) should reduce total feed grain requirements by 400,000 tons, i.e., to 2.6 million tons.

The gap between estimated requirements for 1977 and present feed grain production in Quebec is 1.6 million tons but it is hoped to reduce the deficit to about one million tons by stepping up production by some 500,000 tons through increased acreages and yields. Among the ways which are proposed in order to reach this target are the following:

- — better use of land
- — introduction of new varieties
- — general use of Certified seed
- — increased drainage
- — use of adequate growing methods (recommendations of the Quebec Plant Productions Council)
- — support by the farmers for the government's self-sufficiency program.

This Month with the QWI

President's Notes

If you have written to the office for application forms for the FWIC Convention next June and have not yet received a reply, please write again. Your request may have been lost during the postal strike. There are still a few openings for delegates; write to the Office immediately if you would like to go.

Mrs. Coates and I attended an FWIC Seminar in Ottawa in December. A report by Mrs. Coates will be in next month's Journal.

Spent January 21 and 22 at Macdonald College attending to some business, taping a script, and having some colour slides taken for the FWIC Convention. I was delighted to see a most attractive quilt that has been sent in for the Tweedsmuir Contest. Mrs. Champion, Provincial Secretary, informed me that the five plays received have been sent to Dr. Keith Kevan for judging.

Looking forward to seeing you at Convention during the last week in May.

Miss Edna L. Smith,
President, Q.W.I.

Consumer Protection Workshop

When you go shopping for a toy or for drugs, do you compare the prices of the different brands? Do you look for hidden costs? Not many of us do — not because we don't care — but because we don't know what to look for.

The **Chateauguay-Huntingdon** WI members and friends were privileged to attend a workshop in Ormstown in November which was co-sponsored by the Quebec Department of Agriculture — represented by Madam Levesque of Region 7, who arranged the workshop — and the Federal Departments of Consumer and Corporate Affairs and Health and Welfare — with Mrs. Louise Mahony, Miss St. Hilaire, and Mrs. Hendricks as leaders. The aim was to learn how we can be better and more enlightened consumers.

Mrs. Louise Mahoney from Consumer and Corporate Affairs spoke on the duties of her Department which covers labelling, weights and measures inspections, hazardous products, consumer packaging, etc. The department works with other Government departments in the enforcement of the Food and Drugs Act, agricultural products standards, dairy products act, fish inspection act and maple products act, etc.

Toys are inspected as well as household chemicals, sports equipment and car seats to see if they meet the safety standards and labelling requirements under the Hazardous Products Act. Textile labelling, material content of precious metals, time pieces, furs are some of the other areas where the Consumer and Corporate Affairs Department works. Their main job is to try and prevent consumer fraud at the retail level.

The Health Protection Branch of the Health and Welfare Department is concerned with protecting us from health hazards in foods, drugs, cosmetics, medical and radiation devices on the Canadian market. They also conduct research into causes and cures of diseases and the effects that certain life style habits and aspects of the environment may have on our health. Their main job is to prevent products coming on to the market which would be harmful. As consumers, we have a responsibility, too. The best regulations don't cover everything. We have to learn to protect ourselves and this was the objective of the workshop — to give us the techniques on how to be a good consumer.

The women present worked in five groups and were given selected questions to study. At a general session later these findings were shared with the other groups.

One question dealt with the painkiller acetylsalicylic acid (A.S.A.). This drug is available in many brands and by comparing dosages and prices we learned which to buy for the most reasonable price.

Three hockey helmets of different brands were studied, using the government standards for safety, and we had to decide which conformed most closely to the standards.

Other questions dealt with vitamin supplements, labelling of hazardous products, baby pacifiers, etc.

A real eye-opener on hidden costs came with a study on a doll that can be fed special food and works on batteries. The initial cost of the doll was about $22. We were asked to estimate what it would cost to maintain it for one year, taking into consideration the costs of the special food, diapers, and batteries to run it and allowing a child a conservative two hours a week to play with it. We were

Barachois WI members working at a recent meeting. At another meeting they celebrated the 80th birthday of their oldest member.

amazed to find it would cost over $60 to maintain it for a year. This was a cost few of us consider and it made all those present aware of some of the things we should look for when buying toys.

All the ladies present found the workshop most interesting, and we all felt we would be more careful and better consumers. We were given a project we could work on in our own branches and our findings will be evaluated for us if we send them to Madame Levesque.

Other groups can participate in these workshops by getting in touch with the Department of Agriculture regional representative for their area. An ideal group is between 50 and 80 persons, and the workshop is available in both English and French.
An interesting and helpful pamphlet called "Consumer Contact" can be obtained, free, from Consumer and Corporate Affairs, Box 99, Ottawa/Hull, K1A 0C9, by writing and asking to be put on their mailing list. Consumer complaints can also be made to this address.

Varied Programs in Richmond

Richmond County has a Senior Citizens' residence, the Wales Home, and the branches do their part in entertaining the residents during the year. Birthdays are remembered with gifts and cards. Birthday teas are served and entertainment provided, such as bingo with prizes. Lunches are served at the home and gifts distributed at Christmas.

Two homes for the retarded, the Dixville and Cecil Butters Homes, are also supported by the WI members of this County. Mitts, scarves, caps are knitted and donated to the homes, and toys are given at Christmas. One box of knitted articles was made by a WI member who is a resident of the Wales Home.

Most branches send gifts to patients at the Douglas Hospital and to "Forgotten" patients there. Members support UNICEF, Can-Save, Red Cross, and Poppy Fund amongst many others.

Schools are supported. **Cleveland** gave a donation to their elementary school to encourage pupils in Grade VI who showed the greatest improvement during the year.

Members got wool from the Canadian Save the Children and are knitting mitts, sweaters, etc., for them. They supported a benefit dance for a local farmer whose barn had been destroyed by a freak tornado. A family supper was enjoyed in November. An interesting time was had at a **Gore** meeting when a print of Rembrandt's painting "Night Watch" was passed around and a member, who had seen the original on a European tour last summer, described it and told its story. She had read a recent news report that said that the original painting had been partially damaged. Fortunately it can be repaired. This branch has been a strong supporter of the Canadian Cancer Society since the early 1950s. Since April over 3,000 dressings, 51 hospital shirts, and 17 pairs of knitted bed socks have been sent to the Society, as well as many packets of cottons for cancer dressings.

At a fall meeting the Education Convener brought in large bouquets of wild and cultivated asters. Using the lines "The frosty asters, Like smoke along the hills" as a basis for her talk, she spoke on asters, their growth, cultivation, and beauty.

Two $50 bursaries are offered to graduating students — one boy and one girl — at the local regional school.

Children of the members were special guests at the Christmas meeting where gifts were exchanged. An interesting Roll Call "Wear a piece of old jewellery and and tell its story" was enjoyed by all.

Melbourne Ridge exchanged gifts among themselves and heard a story "Who's more special than the family?" They brought candy and gifts to be distributed to children. The Publicity Convener read an article on the need for substitute grandparents.

The members of **Richmond Hill** WI have been busy with quilts and have made several, some tied. These are for members, charity, or for the branch funds. To augment their funds at one meeting, each person brought in either a loaf of bread or an apron to be sold. A sale of cookies and candy at another meeting raised a nice sum. Many cheer boxes were distributed at Christmas.

Richmond Young Women had a busy fall catering for weddings and helping at the County tea

Mrs. Ezra Woodward and Mrs. Eliz. Miller (centre), Co-Presidents of Beebe branch in Stanstead County, pinning a Sterling silver brooch on Mrs. H. J. Stubbs, prior to her departure for a Home for the Blind in Montreal. Mrs. Stubbs, who has been a member of the branch for 40 years, is 86 and began her WI connections in Howick some 60 years ago.

and bazaar. They bought wool and donated it to the ladies at the Wales Home to knit or crochet. They remembered their two forgotten patients at the Douglas Hospital. All was not work, however, as the members themselves enjoyed a supper out one evening, and at a recent meeting they and their guests were entertained to a slide trip through Germany, Switzerland, and France.

A contest to make a "witch" from a dishmop was part of a Halloween evening at **Shipton.** A display of handwork and exchange of ideas with the ladies of the Cercle des Fermières proved interesting at another meeting. They have raised funds by holding bake sales, and sales of jams, pickles, etc., and with a card party.

The **Spooner Pond** WI plans to enter a needlepoint picture in an inter-branch competition. They assisted at the County tea and bazaar. The Children's Fair this past fall was a very successful one this time. An added interest was a competition on a vegetable collection between the members.

Members enjoyed a contest of jumbled names of Eastern Townships' towns and had fun answering a roll call with a farm animal sound. Diapers are to be made for the Butters Home.

At the Christmas meeting members entertained each other with songs, dance, and readings. A contest on a Christmas table centre was held and later the articles were sold and proceeds went to the Cheer box fund. At each meeting any member who has a birthday that month gives "birthday money," which goes to the Pennies for Friendship fund. Funds were raised with a drawing on a quilt.

Dear WI Members:

The mail strike is over and I am, like the rest of you, very happy about it! Some of the news you have sent me covers several months, and I have tried to include as much as possible.

Christmas meetings were enjoyed in many ways: parties for members and their husbands; carols were sung. A Roll Call was "Christmas memories of early days" (stringing popcorn, soaping the tree, visiting by sleigh with horses and keeping warm with rugs and hot bricks).

Contests were held: a homemade Christmas card, decorated cookies, recognizing a carol from a few bars on the piano. **East Clifton** had a "wrap a gift" contest and then the gift was sent to a forgotten patient at the Douglas Hospital. Others remembered their "forgotten" ones and also sent gifts for the patients at the Douglas.

Everyone remembered the shut-ins with cards and Cheer boxes. Senior Citizens' homes were visited and musical programs, gifts, and lunches provided for the residents. **Ascot** presented corsages to the ladies in one home and pens to the gentlemen.

Valcartier donated towards Christmas trees for their two schools. Children in homes were remembered. Members exchanged gifts.

Rawdon had their annual dinner party, with gifts for "live alone ladies" in their community. This branch sent their usual Christmas parcels (by RCAF in July) containing children's knitted sweaters, mitts, and hats, toys and games and $70 worth of educational books for children ages 2 to 16 years to Nain, Labrador, and Grise Fiord. The cost of supporting their family in India has risen from $60 to $100 per year.

Six grandmothers in **Belvedere** were honoured with gifts. The branch saw slides by an African missionary from Angola who

Aylmer WI in Gatineau celebrated their 50th Anniversary last November. Minutes of past Anniversaries were read and the Roll Call was "memories of Institute work over the past 50 years." A food sale table added nicely to the funds. In this photo from left to right: Miss Janet Riley, cutting the cake, Mrs. Steve Robinson, Mrs. C. Mackenzie, and Mrs. C. Faris.

spoke on his work among the people and on their struggle for independence.

Lennoxville also had a speaker on Africa. Dr. Klinck spoke on his work in Dahomey, a developing French-speaking country in West Africa. These members held a very successful Christmas Bazaar and Supper. Besides the food and handicraft tables, there was a table of surplus garden produce with the proceeds going to the ACWW Nutrition/Education Fund. **Bury** held an auction of jams, jellies, and pickles with the proceeds going to the same fund.

Speakers were heard on such subjects as Scandinavian Christmas customs, youth work in Malaysia, women's rights. **Sawyerville** heard a former member speak on her experience in CUSO as a teacher in Jamaica. **Aylmer** saw slides and heard a commentary by two ladies who had recently completed a tour of Scandinavia and southern England.

Both **Aylmer** and **Wright** assisted at the refreshment table at the Ottawa Royal Winter Fair.

Demonstrations are always interesting and members have been learning how to make macramé plant hangers from binder twine, do candle-making, and découpage. **Sutton** saw a display of flowers that had been made from feathers.

Papers were read on textiles, encephelitis, reforestation, meat labelling, and rust proofing a poor investment.

Many scholarships have been awarded to help students with their education after high school. **Compton County** awarded four last year — three of the students are attending Champlain College in Lennoxville, and one is at the University of New Brunswick in Fredericton.

A Government grant has been received in the Chateauguay Valley for Adult Services. This includes a program of handicrafts for seniors and a daily "hello" service for shut-ins. Parts of the Valley are running a "Meals-on-Wheels" program and WIs have donated money towards the cost of this and members assist where they can.

Pennies for Friendship have been collected and, besides a straight collection, some WIs added to the Pennies in novel ways. One group gave one cent for each letter in the name of their birthplace.

Good citizenship involves many things, not the least, being neighbourly. **Hatley** branch decided to hold a "get acquainted party" to welcome the many newcomers in their area. The mayor and councillors were introduced. Refreshments were served and later there was dancing. By the end of the very successful evening everyone had had a chance to meet one another.

The booklet "Women and the Law" is being studied — one group does one section each month. The James Bay pact between the government and the Indians and Inuits was discussed at one meeting.

The day of the working bee is not over as **Brompton Road** found. They had several card parties etc., to raise sufficient funds to renovate their hall. The menfolk gave their time on two days and the women served lunch. Besides getting the work done in record time, everyone enjoyed real old-time good fellowship.

Money has been raised for WI funds, for hospitals, and local organizations. **Inverness** held an auction with proceeds going to the Memorial Hospital. **Grand Cascapedia** held a rummage sale. They welcomed a new member. Card parties, catering for banquets, and making and selling quilts seem to be some of the most popular ways. Besides adding to the treasury, members enjoy the fun and fellowship of working together.

A late report from **Magdalen Islands** on their very successful Fall Fair. The weather was bad but enthusiasm high. The pet show was a great success with 25 entries. The junior section of the agricultural fair was excellent with more entries than in the adult section. The highlight of the Fair was the handicraft display. It was not easy for the judges to choose from such a variety of exceptionally well done articles. The WI wishes to express their thanks to the judges for a job well done.

A few Roll Calls: One way to raise the standard of rural living; one way progress is changing our lives; an unusual souvenir; an experience remembered from World War I or II.

Mrs. James Robertson,
QWI Publicity.

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